

A radiometric detector (10) has reduced optical losses, improved wavelength selectivity, improved signal to noise, and improved signal processing methods to achieve temperature measurements of an object (16) from about 10°C to 4,000°C. A YAG rod collection optic (12) directly couples object radiation (14) to a filter (18) and photo detector (20). The filter determines which radiation wavelength range is measured, and optionally includes a hot/cold mirror surface (22) for reflecting undesired radiation wavelengths back to the specimen. In a preferred measurement method, at least two detectors are employed, each detecting a different wavelength range. A dual-wavelength temperature measurement computation is employed that is independent of radiation transmission losses and the emissivity of the object being measured.